H->bb Weekly Meeting

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HSG5 H->bb Weekly Meeting, 11 April 2011

Apologies…

I have completely dropped the ball over the past week due to on-call shift duties…

Had no chance of doing anything that involved thinking, like setting up a task list or looking at the MC samples… sorry!

News! News! News!

Meeting last week:

- Simulation workshop tomorrow aimed at the physics needs for 2011-2012 data analysis: https://indico.cern.ch/conferenceDisplay.py?confId=133590

Forthcoming meetings:

- LHC Physics Center (LPCC): Status of Higgs and BSM searches at the LHC – starting TODAY at 2pm and tomorrow https://indico.cern.ch/conferenceDisplay.py?confId=127277
- New meeting on procedures for statistical interpretation of ATLAS results on April 15: https://indico.cern.ch/conferenceDisplay.py?confId=132499
- Workshop on combined performance for 2011, on 14 April: https://indico.cern.ch/conferenceDisplay.py?confId=132123

Monte Carlo Samples

- From last week:
  - Need to review what we have and what we need for the coming year:
  - Several ongoing strands:
    - Giacinto looking into Wbb in Powheg
    - Michiel looking into MC@NLO for VH signal
    - Michiel/Chris C-T, Aurelio: discussion of ttbb ME production in Alpgen
    - Mass points:
    - ZH(Zll), WH(Wlnu), ttH, VBF(Hbb) analyses have mass points: 115, 120, 125, 130 GeV/c2
  - Any more WH/ZH (boosted/non-boosted) samples needed?
  - Additional backgrounds?

- Michiel giving a talk today
- **We urgently need to check the available MC samples**
  - The HSG5 request for this summer was already sent (see email from Chris C-T on Thursday 7/4)

Task Assignment

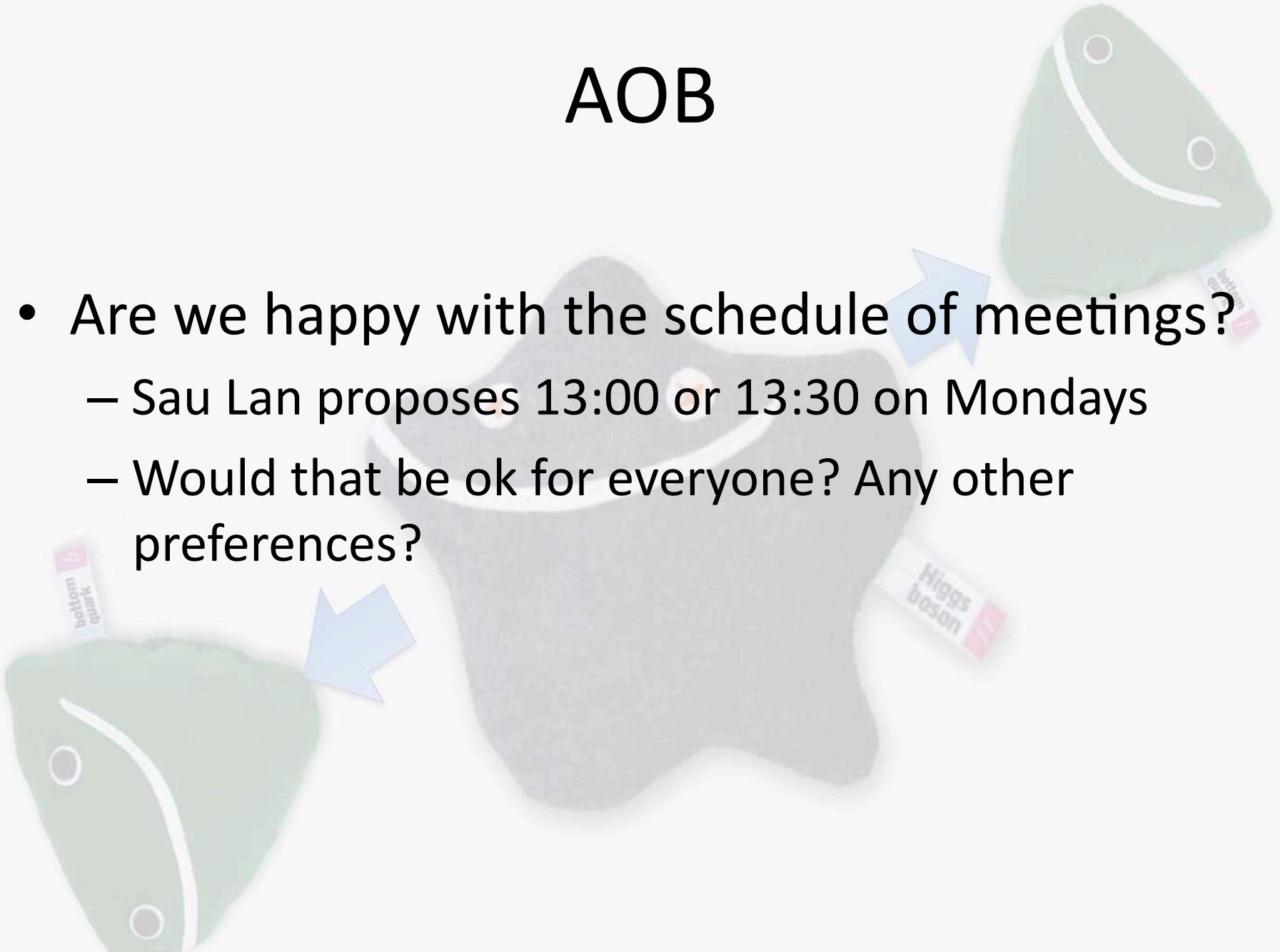
- Need to study systematic effects and try to improve on them
- Effects should be evaluated with at least $1fb^{-1}$ in mind
  - What is the effect of each systematic uncertainty or each alternative reconstruction method on $S/\sqrt{B}$
- In addition need someone to:
  - Follow developments of MC/D3PD production
  - Follow up on trigger evolution – in touch with Higgs trigger group
  - Follow up on GRL issues

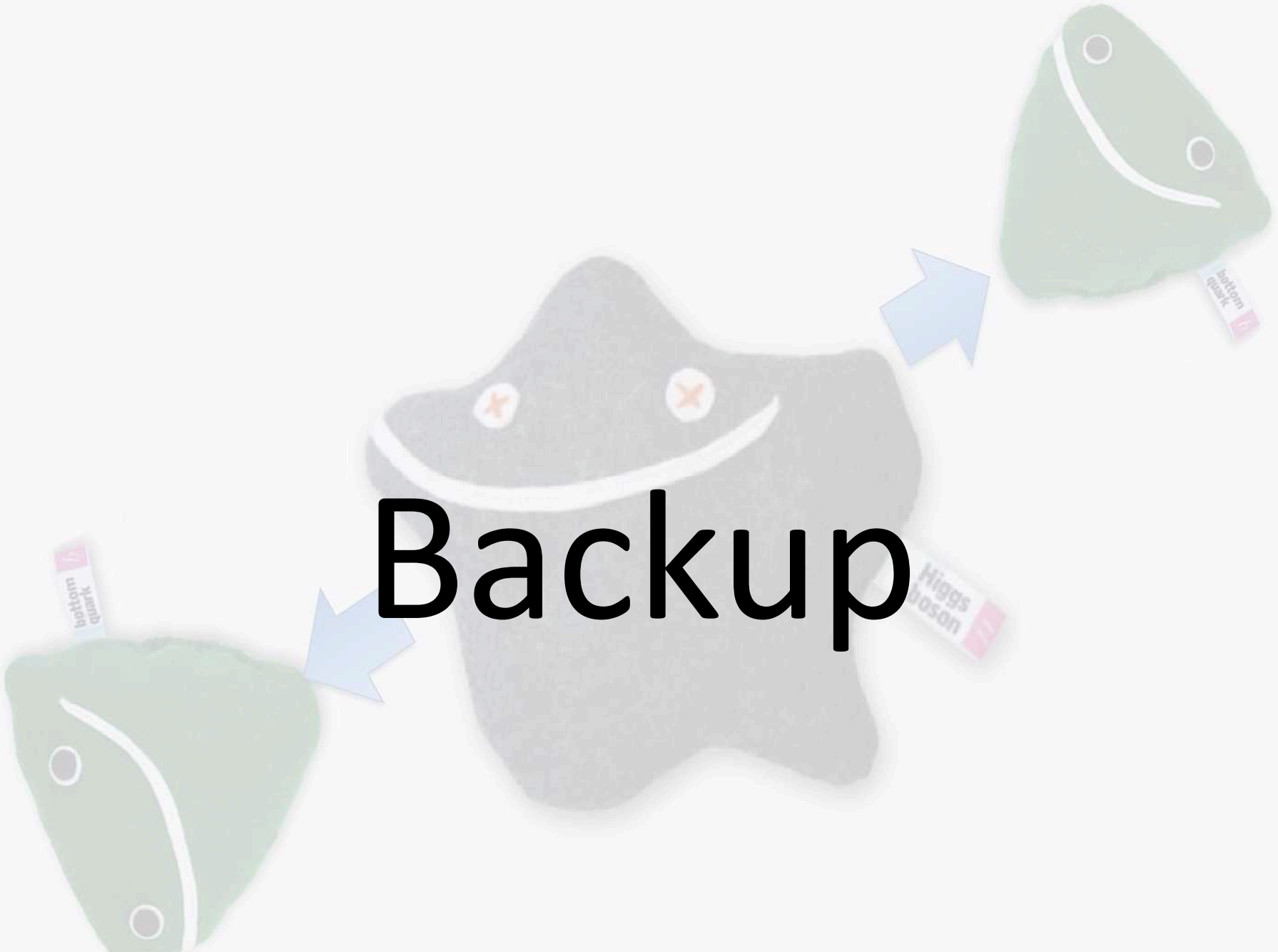
Task	Obs	Candidate(s)
Trigger: study optimal trigger for the 2011 data Bear in mind that single-lepton triggers will likely increase to p_T thresholds of ≈20 GeV – i.e. analysis cuts will need to increase to ≈22 GeV; check also any sculpting, angular acceptance, etc	Does this need AODs? Enough info on WZ/top D3PDs? Sample A or sample T should have the foreseen menus Liaise with Gemma Wooden	
Muon reconstruction: investigate different options		
Electron reconstruction: investigate alternatives	Inclusion/exclusion of cracks Inner detector cuts (B layer?)	
Pileup: what do we need to do with 2011 pileup	Reweighting method Jet vertex fraction Choice of vertex reconstruction	

Task	Obs	Candidate(s)
Jet energy scale: investigate size of systematic uncertainty	Worry about b jets Any way to improve di-jet mass resolution? Liaise with JetETmiss	
B tagging algorithms	Effect of each different choice on significance	
Fast monitoring: implement WH baseline selection in online monitoring infrastructure	Example exists Involves programming in Athena Liaise with Fabien Tarrade	
Lots of other things…		

AOB

- Are we happy with the schedule of meetings?
  - Sau Lan proposes 13:00 or 13:30 on Mondays
  - Would that be ok for everyone? Any other preferences?





Backup

Baseline analysis for WH, H->bb

Recommendations for WH baseline
Differences wrt WH cut flow
Expected CP recommendations for 2011

Sources:

lvqq: (winter note)	https://twiki.cern.ch/twiki/bin/view/AtlasProtected/HiggsWWsemilepConfNote2011Winter
llqq: (winter note)	https://twiki.cern.ch/twiki/bin/view/AtlasProtected/HiggsZZllqq
W/Z common:(2010 data)	https://espace.cern.ch/atlas-sm-wz-physics/Lists/Common%20Selection/AllItems.aspx
WH selection for cut flow:	https://twiki.cern.ch/twiki/bin/view/AtlasProtected/WHNoteSummer2011

Muon Selection	**lvqq**	**llqq**	**W/Z common**	**WH->lvbb (cut flow)**	**Proposal for WH**	**Obs**
finder	Staco combined or MuTag	Staco combined or MuTag	Staco	Muid	Muid + segment tags	Investigate MuTag and Staco later
pT	> 20 GeV	> 20GeV	> 20 GeV	> 20 GeV	> 20 GeV	may need to go to 22GeV - study trigger
|eta|	< 2.4	< 2.5	< 2.4	< 2.5	< 2.4	muon trigger coverage
MCP quality cuts	yes	yes	yes	yes	yes	
|Z0 wrt PV|	< 10mm	< 10mm	< 10mm	< 10mm	< 10mm	
|d0 wrt PV|	< 1mm	< 1mm	< 0.1mm	< 1mm	< 1mm	study later?
isolation	pT(calo)20<1.8GeV	pT(trk)20<1.8GeV	pTtrk20/pT<0.1	pT(trk)20<1.8GeV	pTtrk20/pT<0.1	But study effect of different approaches
Electron selection						
author	1 or 3	1 or 3	1 or 3	1 or 3	1 or 3	
PID	RobusterTight	RobustMedium	Med/Tight_withTrackMatch	Tight_withTrackMatch	Tight_withTrackMatch	Investigate alternatives later
pTcluster	> 20 GeV	> 20 GeV	> 20 GeV	> 20 GeV	> 20 GeV	may need to go to 22GeV - study trigger
|eta|	< 2.47 excl. crack	< 2.5 incl. cracks	< 2.47 excl. crack	< 2.5 excl. crack	< 2.47 incl. crack	But check effect of crack in study the crack after studies
isolation	etcone30<6GeV	NA	caloIso98 (what's this???)	NA	NA	This should be studied
b-layer hit	NA	NA	yes	NA	NA	Do we need b-layer hit cut?
|z0 wrt PV|	< 10mm	NA	NA	NA	NA	
|d0 wrt PV|	d0signif < 10	NA	< 0.1mm	NA	NA	But study effect of different approaches
vertex						
primary vertex	Nvtx>=1 & Ntrks>=3	Nvtx>=1 & Ntrks>=3	Nvtx>=1 & Ntrks>=3	Nvtx>=1 & Ntrks>=3	Nvtx>=1 & Ntrks>=3	Apply to first vertex
MET						
algorithm	MET_LocHadTopo(|eta|<4.5) + MET_MuonBoy-MET_RefMuonTrack	MET_LocHadTopo - Sum(pTmu - ETlossInCalo)	METRefFinal	MET_LocHadTopo - Sum(pTmu - ETlossInCalo)	METRefFinal	Investigate alternatives later
Jet selection						
finder	AntiKt4H1Topo	AntiKt4H1Topo	AntiKtTopo (0.4 priority)	AntiKt4Topo	AntiKt4Topo	Should check other options
pT	> 30GeV	> 25GeV	> 30GeV	> 25GeV	> 25GeV	Investigate alternatives later
scale	EM+JES	EM+JES	EM+JES	EM+JES	EM+JES	
calibration	H1	H1	?	?	?	Should check other options
|eta|	< 4.5	< 3.2	< 4.5	< 2.5	< 4.5	
jet vertex fraction	NA	< 0.75 wrt PV	NA	< 0.75 wrt PV	< 0.75 wrt PV	Investigate pileup - to be changed in 2 weeks
jet cleaning	Loose	Loose	Medium	Loose	Loose (for pTjet>20GeV and not MC)	Investigate alternatives later - use OffsetEtaJES tool to data only
Overlap removal						
jet-e	remove jet for dR<0.3	remove jet for dR<0.4	remove jet: dR<0.2(0.5 if pT>20)	remove jet for dR<0.4	remove jet for dR<0.4	Investigate alternatives later
mu-jet	NA	remove muon for dR<0.4	remove jet: dR<0.2(0.5 if pT>20)	remove muon for dR<0.4	NA	Investigate alternatives later
mu-e	remove electron for dR<0.1	NA	NA (for 2011 data recluster jets)	remove muon for dR<0.4	NA	Not needed (2nd lepton veto)
Event selection						
trigger						Need to investigate trigger
event cleaning	jet/ETmiss recommendation	jet/ETmiss recommendation	jet/ETmiss recommendation	jet/ETmiss recommendation	jet/ETmiss recommendatio	same as Jet cleaning
lepton	exactly 1 lepton	exactly 2 leptons same flavour	exactly 1 lepton	exactly 1 lepton	exactly 1 lepton as defined	
extra lepton veto e channe	veto robustMed. Electrons	opposite charge, veto otherwise	veto additional med.electrons	veto additional tight electrons	veto add. signal electrons	Investigate alternatives later
extra lepton veto mu chan	NA		veto add. combined muons	veto add. combined muons	veto add. signal muons	Investigate alternatives later
lepton pT additional cut	> 30GeV	NA	NA	NA	NA	
MET	> 30GeV	< 50GeV	> 25GeV	> 25GeV	> 25GeV	Investigate alternatives later
Njets	exactly 2 or 3	>=2	NA	>= 2	>=2	
b tag	b-tag veto (SV0>5.72)	NA	SV0>5.85, |eta|<2.1, pT>30	IP3D+SV1 > 1.55	Investigate 1 and 2-tags	Start with IP3D+SV1>1.55, but check all possibilities
Additional cuts	m(jj) near mW & |eta(j)|<2.8	70<m(jj)<105, 76<m(ll)<106, etc	NA	MT > 40 GeV	MT > 40 GeV	Investigate alternatives later

Date	Milestones wish list
17 May	Dubna workshop – analysis frozen After this: add data to un-boosted analysis and prepare for result approval Concentrate more effort on boosted VH with a view to obtaining results quickly
10 May	Review results with 2011 data from cut-based and multivariate analyses
3 May	Margin for dealing with unforeseen problems
26 April	Start looking at 2011 data if enough is available. Any surprises? How does the MC describe the new data? By now we should have a reasonable idea of results from the multivariate analysis
19 April	End of 2 weeks of beam scrubbing. (I'm away for Easter)
12 April	By now we should have a reasonable idea of the exclusion of the cut-based analysis First report on MVA preliminary results – establish plan for getting results by Dubna
5 April	Identify the worst systematics and discuss any possible improvements: •Any changes needed in analysis cuts? •Any study necessary for corrections to some systematic effect? Multivariate analysis: iterate on preselection cuts, methods, questions Assign tasks – divide the work to achieve better results!
29 March	Establish analysis cuts: •If possible as result of optimization •Use 2010 data to develop cuts and show that data is well described by background MC Start evaluating systematics
22 March	Iterate on analysis cuts – why is each cut applied at each particular value? Start iteration on multivariate methods to improve analysis

Reconstruction issues

- **Muon** CP group recommendations for release 16:
  - Reconstruction efficiency and isolation efficiency scale factors, momentum smearing functions
  - https://twiki.cern.ch/twiki/bin/view/AtlasProtected/MCPAnalysisGuidelinesRel16
- Jet/Etmiss recommendations for **jet cleaning** in release 16:
  - Medium jet cleaning should give similar rejection to rel 15 cleaning but with better efficiency
  - Tight jet cleaning should not be used – still under discussion
  - https://twiki.cern.ch/twiki/bin/view/AtlasProtected/HowToCleanJets#Bad_jets_rel16_data
- New!: Final **b-tagging calibrations** for release 16 based on full 2010 data:
  - https://twiki.cern.ch/twiki/bin/view/AtlasProtected/Analysis16
- e/gamma recommendations for **energy scale and resolution** in release 16:
  - https://twiki.cern.ch/twiki/bin/view/AtlasProtected/EnergyScaleResolutionRecommendations
  - And rescaler tool: https://twiki.cern.ch/twiki/bin/view/AtlasProtected/EnergyRescaler
- Standard Model **W/Z** group **baseline selection** for release 16 (next 4 slides):
  - See discussion in W/Z group Sharepoint
  - Also, finer points (and perhaps the not so fine) still being discussed